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DHS Science and Technology Directorate

Advanced Multi-threat Base Ensemble for Responders

Addressing first responder base protective workwear needs

The need for clothing and equipment that provides protection against “all hazards in an unpredictable response environment” was identified in the [Project Responder 3](#) report. The first responder work environment requires a multi-threat base protective ensemble that can be worn as a normal duty uniform (i.e., “base ensemble”) and it must be compatible with the specialized protective garments required to meet the needs of specific public safety disciplines (e.g., firefighting, EMS, law enforcement). Some specialty areas (e.g., explosive ordnance disposal, HAZMAT, etc.) require an enhanced level of performance and protection than this base ensemble can provide. Currently, no base ensembles meet this capability gap.

Designing and developing a new multi-hazard protective base ensemble

The Advanced Multi-threat Base Ensemble for Responders (AMBER) garment was designed and developed for the Department of Homeland Security Science and Technology Directorate (S&T) by North Carolina State University’s Textile Protection and Comfort Center (T-PACC). T-PACC partnered with Protect the Force, Inc. (PTF), a company that provides products for military and first responder applications. The AMBER project team identified and selected commercially available materials that met various protective requirements to develop a base ensemble that provides protection against multiple threats and maximizes comfort for prolonged daily wear. This effort was further supported by input and feedback from S&T’s First Responders Resource Group to ensure the AMBER garment met first responders’ operational requirements.

Key AMBER Base Ensemble design goals and features:

- Comfort and durability for daily wear;
- Provide limited protection against heat and flame, splash resistance, and rip/tear resistance; and
- Modular design for integration with primary protective clothing against specific hazards

The AMBER garment is certified to the National Fire Protection Association (NFPA) 1975 Standard on Emergency Services Work Clothing Elements, 2014 Edition.



AMBER incorporates commercial-off-the-shelf technology into a base ensemble that will increase first responder protection

The NFPA 1975 Standard provided guidance on testing methods for the development of the AMBER garment ensemble prototype.

Testing to determine the garment’s ability to meet performance goals occurred at T-PACC’s research and testing facilities, which enabled systematic testing and evaluation of the base ensemble prototype. These included tests for fire and heat protection, liquid repellency and splash protection, as well as evaluation of thermal comfort and heat stress. In addition, human subject ergonomics evaluations were performed. A total of 150 certified prototype garments were delivered to S&T for operational wear testing and evaluation by responders, including international responders from the United Kingdom and Sweden.

Impacting the future of first responder PPE

Project development and prototype manufacturing were completed in December 2017, and first responder wear testing is anticipated to begin in early 2018. This will result in a garment that has been comprehensively developed and assessed using input from the first responder community. Input from the wear testing will be provided to PTF prior to commercialization.



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To learn more about Advanced Multi-threat Base Ensemble for Responders (AMBER) or the Base Ensemble project, contact First.Responder@hq.dhs.gov.

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